

Rastio

Grid data I/O
Interface definition

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1 Introduction

The TopoRast raster time-series database imports raster data from files and provides time series. Exporting rasters is not supported.

Rastio now allows the import and export of rasters via a network interface and the generation of raster images.

Rastio is controlled via URL and outputs XML, PNG, or TIFF. The commands are described below.

2 Rastio Command

Commands are sent to Rastio in the form of a URL that contains the hostname, the port, the name of a Raster database (if applicable), and the function. This URL must be sent using the HTTP protocol as a GET (or POST, if applicable) request. Example

```
http://rastio.server.net:8050/tt?Cmd=GETPNG&Time=1.1.2013_0:00
```

The Rastio protocol includes the following commands:

- GET - Reads a raster in GeoTIFF format from the database
- DIST - Reads a raster in GeoTIFF format from the database
- PUT - Writes one or more rasters in GeoTIFF format to the database
- GETPNG - Reads a raster as a PNG image from the database
- DISTPNG - Reads a raster as a PNG image from the database
- GETMULTI - Reads multiple rasters from the database as a Multi-GeoTIFF
- FLUSH - Completes all write operations to the database.

The examples in the following command descriptions all use the raster grid database `tt` with the channel `Temperature`.

2.1 GET

Returns a raster in GeoTIFF format from a grid database for a specific time and, if applicable, a specific channel. The result is sent in HTTP format as image/tiff. The request is an HTTP GET.

Parameters are

Time The time at which the raster was stored in the database. The format is flexible; spaces must be replaced with `_`. This parameter is required.

Param Only required if multiple channels (e.g., temperature and humidity) are stored in the database. If no channel is specified and multiple channels are present in the database, the first channels is used.

Example: `http://host:8050/tt?Cmd=GET&Time=17.8.2014_12:35&Param=Temperature`
TIFF tags used:

0100 Number of columns 16 bit unsigned

0101 Number of rows 16 bit unsigned

0102 32 bits per value, 16 bit unsigned

0103 1 = no compression, 16 bit unsigned

0153 3 = 32 bit IEEE 754 floats, 16 bit unsigned

830e Tile width/Tile height/0 64 bit IEEE 754 double float

8482 Reference point 0/0/0/llx/luy/0 64 bit IEEE 754 double float

87b1 ASCII: Time|Channel|Unit|Time Step

a481 ASCII: '201c'4e37201d' is a gap

2.2 DIST

Returns a raster in GeoTIFF format from a grid database for a specific time interval, an evaluation type, and, if applicable, a specific channel. The result is sent in HTTP format as image/tiff. The request is an HTTP GET.

Parameters are

From the start of the range to be analyzed. The format is flexible; spaces must be replaced with `_`. This parameter is required.

To the end of the range to be analyzed. The format is flexible; spaces must be replaced with `_`. This parameter is required.

Stat the evaluation type: sums (SUM), averages (AVG), minima (MIN), or maxima (MAX). If this parameter is not specified, averages are calculated.

Param Required only if multiple channels (e.g., temperature and humidity) are stored in the database. If the channel is not specified and there are multiple channels in the database, the first channel is used.

Example:

`http://host:8050/tt?Cmd=DIST&From=27.10.2015_7:00&To=28.10.2015_7:00 &Stat=Sum&Param=Pre`

2.3 PUT

Exports one or more grids to the grid database starting from a specific time and, if applicable, for a specific channel. The grids are transmitted via HTTP POST in binary GeoTIFF format, one after another without interruption. The result is an XML response containing 201cOK201d or an error message, e.g., *invalid grid time*.

During import, grids whose size does not match the grid database are rejected.

URL parameters are

Time the time from which the grids are to be stored in the database. The format is flexible; spaces must be replaced with `_`. This parameter is required.

Param Only necessary if multiple channels (e.g., temperature and humidity) are stored in the database. If no channels is specified and there are multiple channels in the database, the first channels is used.

NoFlush Useful when sending many rasters in succession. The database then remains open and thus does not perform a time-consuming flush. After the PUT of the last raster, a final FLUSH command must be issued.

Example: `http://host:8050/tt? Cmd=PUT&Time=August 17, 2014_12:45&Param=Temperature` followed by binary data in GeoTIFF format.

For all rasters, the values stored in the introduction of the Raster-ZR-DB are used. However, it is possible to specify the time and parameter for each raster in GeoTIFF. Use TIFF-Tag 87b1 (see GET).

2.4 GETMULTI

Retrieves multiple raster images in Geo(Multi)TIFF format from a grid database for a specific time period and, if applicable, a specific parameter. The result is sent in HTTP format as image/tiff. The request is an HTTP GET.

Parameters are

From the time at which the first raster was stored in the database. The format is flexible; spaces must be replaced with `_`. This parameter is required.

To the time at which the last raster was stored in the database. The format is flexible; spaces must be replaced with `_`. This field is required.

Param Only required if multiple channels (e.g., temperature and humidity) are stored in the database. If no channels is specified and multiple channels are present in the database, the first channels is used.

Subst Replacement value for missing grids. Specifying a replacement value also specifies that grids are supplied at a fixed time interval. The step size is determined by `TimeStep` in the intro file. If grids are missing, replacement grids are constructed that contain the replacement value in every tile. Grids that do not lie on rasterized times (determined by `From`) are rounded to the nearest fitting time. Grids that are duplicated after this rounding are deleted.

Example:

`http://host:8050/tt?Cmd=GETMULTI&From=17.8.2014_12:00&To=18.8.2014_12:00`

For each raster, the TIFF tags are used as described for the GET command.

2.5 FLUSH

Closes the data base file on disk. You must use this command if you import rasters using the option `NoFlush`. Without `NoFlush` the file is closed after each write operation and opened again for the next one. This is very time consuming. This command uses `http-GET`. There are no further parameters to this command.

Example: `http://host:8050/tt?Cmd=FLUSH`

2.6 GETPNG

Retrieves an image in PNG format from a grid database at a specific time and, if applicable, for a specific parameter. The request is an HTTP GET.

Parameters are

Time The time at which the raster was stored in the database.

The format is flexible; spaces must be replaced with `_`.

This parameter is required.

Param Required only if multiple channels (e.g., temperature and humidity) are stored in the database. If no channel is specified and multiple channels are present in the database, the first channel is used.

RGB1 The color value of the minimum color in hexadecimal form. The default is `FF0000`, i.e., red.

RGB2 The color value of the maximum color in hexadecimal form. The default is `0000FF`, i.e., blue.

MINVAL The minimum value. The default is `-27.5`. Values in the grid that are less than or equal to this value are rendered in `RGB1`.

MAXVAL The maximum value. The default is 100. Values in the grid that are greater than or equal to this value are rendered in RGB2.

The result is an image in PNG format that contains, for each tile in the raster, a pixel in the colors ranging from RGB1 to RGB2 in 255 color steps.

Example:

```
host:8050/tt?Cmd=GETPNG&Time=17.8.2014_12:45&RGB1=00FF00&RGB2=00FFFF&MINVAL=0&MAXVAL=30
```

2.7 DISTPNG

Delivers a PNG image from a grid database, a specific time range, an evaluation type and, if applicable, a specific parameter. This command is a http-GET. Parameters are similar to GETPNG, but uses **From** and **To** rather than **Time** to specify a range.

See the command DIST for the types of evaluation.

Example:

```
host:8050/tt?Cmd=DISTPNG&From=27.10.2015_7:00&To=28.10.2015_7:00 &Stat=Mit&RGB1=00FF00&R
```

3 Format of the inquiry

3.1 Authorization

In the HTTP header of a request, the username and password are passed on a single line in the format 201c'Authorization: Basic username:password201d2018 , where the string 201c'username:password201d2019 is encoded using Base64 (RFC 3548, Chapter 3).

Example:

```
GET /tt?Cmd=FLUSH HTTP/1.0
Authorization: Basic dXNlcm5hbWU6cGFzc3dvcmQ
```

Rastio verifies the user using the specified password. If the password is incorrect or the user does not exist, an 201c'HTTP-401'201d response is generated. In a browser, this results in a login screen.

4 XML format

The result of Rastio is XML coded in a http header.

Example:

```
HTTP/1.0 200 OK
Date: Tue, 28 Oct 2009 13:49:10 GMT
Server: RASTIO/1.0 (UNIX)
Last-Modified: Tue, 28 Oct 2003 13:49:10 GMT
Expires: Tue, 28 Oct 2009 13:49:10 GMT
Cache-Control: max-age=0
Connection: close
Content-Length: 6733
Content-Type: text/plain; charset=ISO-8859-1

<?XML version="1.0" encoding="ISO-8859-1"?>
<RIOR>
<OK>OK</OK>
</RIOR>
```

Lines are terminated with a Linefeed (ASCII-Char 10).

5 Start and configure Rastio

5.1 Start and Stop

On the server, rastio is started like this:

```
rastio [option] [&]
```

The &-sign at the end lets the rastion process run in the background.

A series of status messages are displayed at startup.

The 8050 port is typically and per default used as the Rastio port.

Per default the user must authenticate to RastIO. You may disable that.

Uses the Comamnd `killall`, `pkill` or `kill` to stop the service.

```
>killall rastio
```

5.2 Options

When starting the Rastio service, you can control it using a number of options. The following overview is also displayed if you try to start `rastio` with unknown options:

```
usage: rastio [OPTION]
      -h, --help          : shows this list
      -v                  : output version & compilation date
```

-p <port> : use port <port> rather than 8050
-noauth : disable authentication
-nowrite : disable all write access
-verbose : be more verbose on init
-startdir <dir> : starts in <dir>